Sept. 26, 1939. A. E. BROUGHTON 2,173,931

PAPER-SLITTING DEVICE

Filed Aug. 25, 1938 2 Sheets-Sheet 1

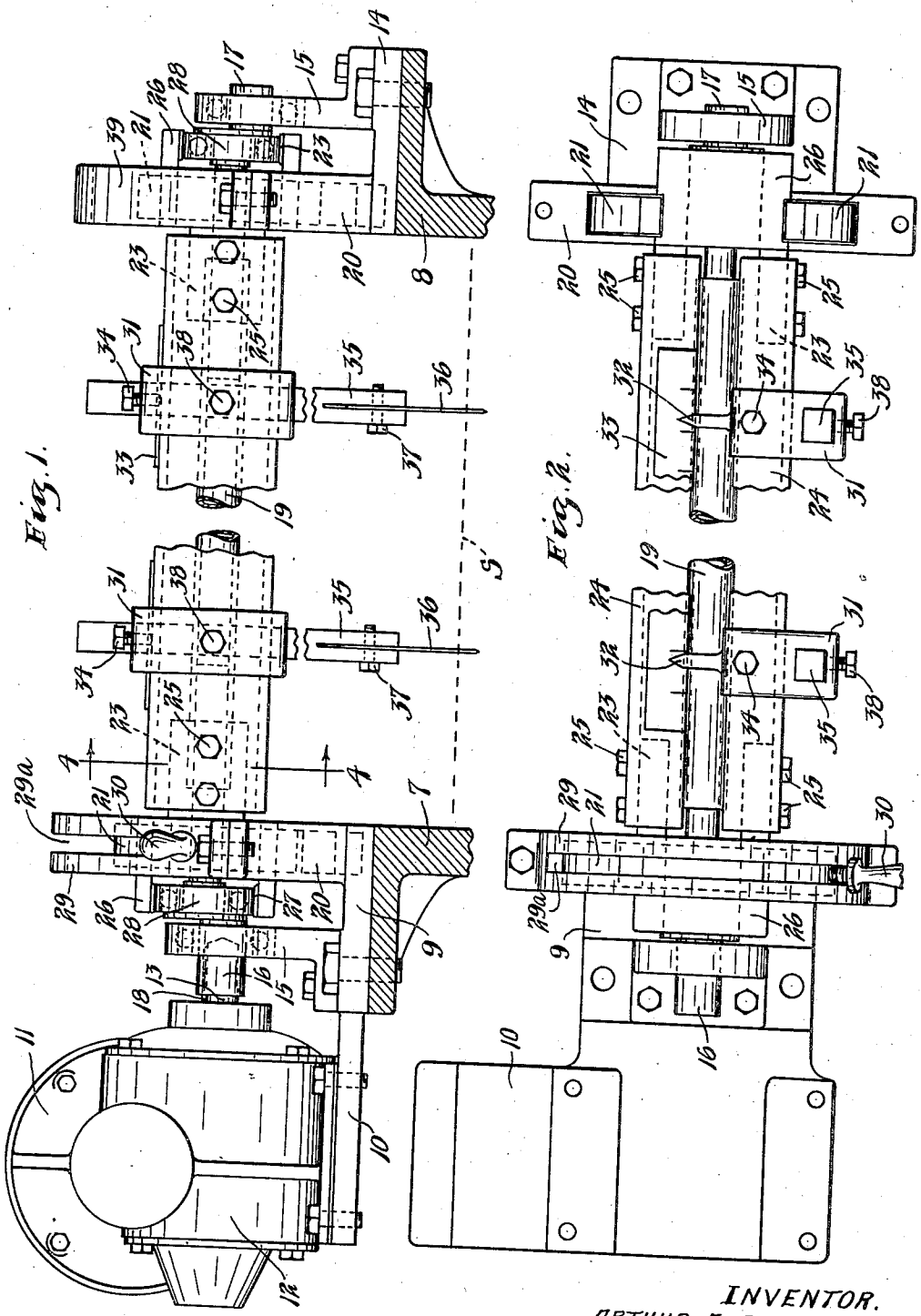


Fig. 1.



Fig. 2.

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Fig. 3.

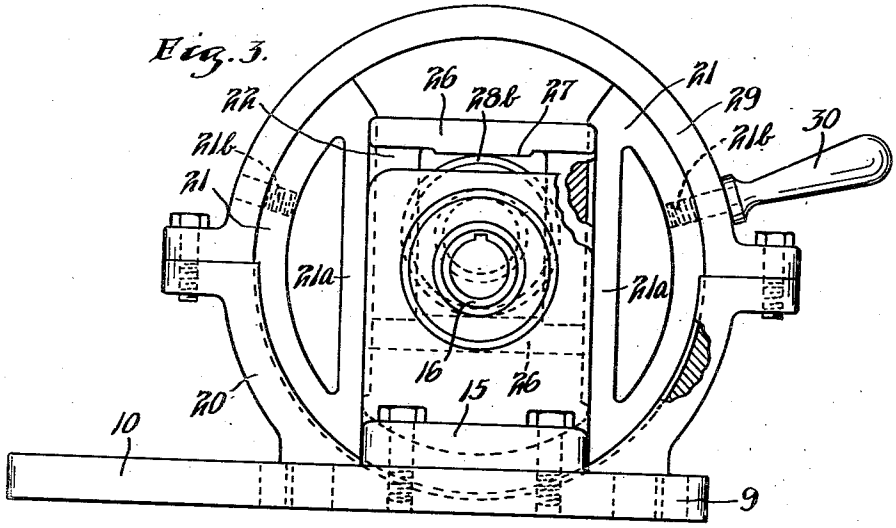



Fig. 4.

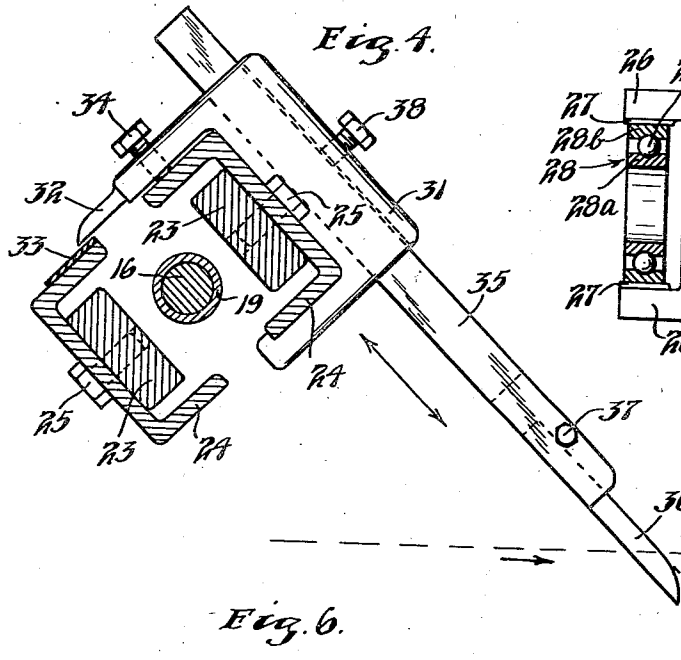



Fig. 5.

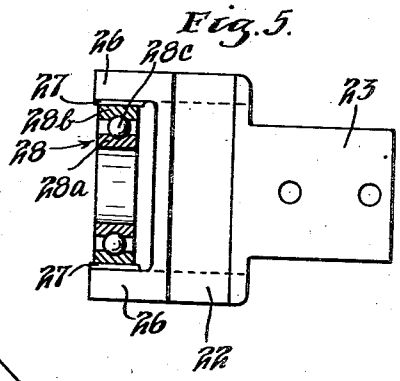
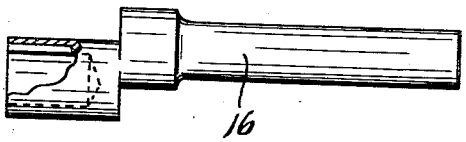



Fig. 6.




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## PAPER-SLITTING DEVICE

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Application August 25, 1938, Serial No. 226,721

6 Claims. (Cl. 164—47)

This invention relates to slitting devices for paper, cloth, and other sheet material.

In the production of paper, after the formed sheet has been wound in a wide roll at the dry end of the machine, it is often the practice to run the sheet through what is known as a rewinder and slitting machine and in this machine the paper is slit along lines parallel to the edges of the paper and rewound onto a mandrel, the rolls formed on the mandrel being of course of shorter width than the wide original roll.

It is one of the objects of the present invention to provide a novel and improved slitting device for use in such slitting and rewinding machines and elsewhere which will prevent fuzz or fine particles of the paper or other sheet material being slit from forming at the point where the paper or other sheet material is slit to prevent tearing of the sheet and other injury.

Another object of the invention is to provide a slitting knife or blade of thin, light weight construction and means for imparting reciprocating rectilinear movement to said blade along the line of the cutting edge of the blade so that as the blade slits the sheet, the blade moves relative to the sheet to present fresh cutting surfaces and the heat generated by the slitting action is quickly dissipated so as to give the blade long life without destroying the temper of the blade.

A further object is to provide a slitting device including a slitting blade having straight line reciprocating movement and means for quickly and readily varying the angle of reciprocation of the blade.

The objects and advantages of the invention will more fully appear from the following description, made in connection with the accompanying drawings, in which like reference characters refer to the same or similar parts throughout the various views, and in which,

Fig. 1 is a view in side elevation of a paper slitting device embodying the invention;

Fig. 2 is a plan view of the same with the driving mechanism removed;

Fig. 3 is a view in end elevation of the same looking toward the left end of Fig. 1 with the driving mechanism removed;

Fig. 4 is a vertical section taken on the line 4—4 of Fig. 1, but showing the knife holding carriage set at a different inclination than is shown in Figs. 1, 2 and 3;

Fig. 5 is a detail of certain of the parts; and

Fig. 6 is a detail of one of the crank shafts used.

Referring to the drawings, the numerals 7 and 8 respectively represent opposite side frames of a paper slitting and rewinding machine wherein a sheet S of paper, cloth or other material is adapted to be longitudinally slit and rewound as on a mandrel (not illustrated).

Mounted on the side frame 7 is a support 9 having an extension 10 forming a shelf for a suitable motor 11 and reduction gearing located with a gear housing 12. It is sufficient to state that a drive shaft 13 projects inwardly from the gear housing 12 and this drive shaft is driven from the motor 11 through the reduction gearing in the housing 12, the shaft 13 rotating preferably at slow speed. The particular assembly 11, 12 and 13 illustrated is of a type now well known on the market, the reduction gearing being of the worm and planetary reduction gear type. Opposite the support 9 a second support 14 is secured to the side frame 8 and secured to the two supports 9 and 14 and projecting upwardly therefrom are oppositely disposed bearing brackets 15. The bearing bracket 15 carries a ball bearing receiving a short crank shaft 16, while similarly the bearing bracket 15 carries a ball bearing receiving an oppositely facing short crank shaft 17. The two crank shafts 16 and 17 are similar with the exception that the crank shaft 16 is recessed at its outer end to receive the drive shaft 13 and a key 18 for anchoring the crank shaft 16 to the drive shaft 13 for rotation therewith. The inner ends of the two crank shafts 16 and 17 are interconnected by a tube 19 so that in reality the two crank shafts 16 and 17 and the tube 19 form one long crank shaft. The tube 19 is employed to lighten the construction and give somewhat greater rigidity thereto than would otherwise be the case if a solid construction were employed and the tube is also used to permit of more ready assembly of the other parts of my device.

Preferably formed integral with and upstanding from the two supports 9 and 14 are arcuate-shaped guide brackets 20 which have their arcuate edges grooved to receive for rotation therein guides 21. As best shown in Fig. 3, each guide 21 is of partially circular exterior to turn in its guide bracket 20 and it is provided with opposed parallel columns 21*a* at its interior portion, the lower ends of the columns being joined and the upper ends not being joined.

Received between the opposed columns 21*a* of each guide 21 is a block 22 grooved at its side edges to receive the columns 21*a* and therefore mounted for rectilinear reciprocating sliding movement in the guide. Each block 22 has a pair of inwardly extending arms 23 located one at

either side of the pipe 19 and long channel members 24 are secured as by bolts 25 to the corresponding arms 23 of the opposite blocks 22 and, of course, these channels 24 extend across between the opposite blocks 22 to form with the blocks a carriage structure.

Each block 22 also has upper and lower outwardly projecting arms 26 having respectively upper and lower bearing tread surfaces 27 thereon. A ball bearing 28 is located between the upper and lower tread surfaces 27 of each block 22 and each ball bearing has an inner race 28*a* shrunk or driven on to the crank portion of one of the crank shafts 16 or 17. It has an outer race 28*b* which works against the tread surfaces 27 of the particular block 22 adjacent which it is located and it, of course, has balls 28*c* located between its inner and outer races 28*a* and 28*b*. With this construction the inner races 28*a* of the bearings 28 will rotate with the crank portions of the two crank shafts 16 and 17 and of course the rotary movement of the crank portions of the crank shafts in the line of possible sliding movement of the blocks 22 will be transmitted to these blocks so as to impart reciprocating rectilinear motion to these blocks. Side movement of the crank portions of the crank shafts in directions at right angles to the line of possible movement of the blocks 22 will not be imparted to the blocks, the outer races 28*b* of the ball bearings 28 being capable of free movement relative to the tread surfaces 27 longitudinally of these tread surfaces. With this arrangement it will be seen that reciprocating rectilinear movement will be imparted to the carriage formed by the blocks 22 and the channels 24.

Attached to the left hand guide bracket 20 as viewed in Figs. 1 and 2, to fit over the guide 21, is an arcuate cap 29 having a slot 29*a* therein to permit movement of a handle 30 which may be threadedly connected with one of two tapped openings 21*b* formed in the left hand guide 21. This handle 30, when engaged in one of the tapped openings 21*b*, may be tightened down against the cap 29 to retain the two guides 21 and the parts held thereby in a set position within the guide brackets 20. By loosening the handle 30 and swinging the same the two guides 21 together with the carriage formed by the blocks 22 and channels 24 may be rotated to a different position relative to the guide brackets 20 and thus the angle of rectilinear reciprocation imparted to the carriage may be varied.

Mounted on the upper of the two channels 24 for sliding movement longitudinally of that channel are one or more carriers 31. These carriers each carry a pointer finger 32 working over a scale plate 33 secured to one flange of the lower channel 24 and each carrier is adapted to be secured to the upper channel in a desired adjusted position longitudinally thereof as by means of a set screw 34. Slidably received within each carrier 31 and set normal to the crank shafts 13 is a knife holding shank 35 which is slotted at its lower end and formed to receive and hold a knife or cutting blade 36. The cutting blade is securely clamped in place within the slotted end of a shank 35 by means of a bolt 37 loosely received through one arm of the slotted portion and screw threadedly received within the other arm of the slotted portion. The knife 36 or cutting blade, it should be noted, has a straight lower edge as best seen in Fig. 4 sharpened to razor keenness and the blade itself is quite thin and quite light. The knife shank 35 is adjustably held in the passage in the carrier 31 as by a set screw 38.

If desired, the guide bracket 20 at the right hand side of the machine as viewed in Figs. 1 and 2, may be equipped with an arcuate cap 39 corresponding to the cap 29 with the exception that it is not necessary to slot the cap 39.

It will be understood that as the slitting device is shown the paper web or sheet S will move beneath the channels 24 of the carriage 22—24 in the direction indicated by the arrow Fig. 4. While in Figs. 1, 2 and 3, the blocks 22 are shown as being located for reciprocating movement in a vertical direction, if it is assumed that the sheet S runs in a horizontal plane, the guides 21 and carriage will be swung by means of the handle 30 so that the channels 24, shanks 35 and knives 36 take approximately the position shown in Fig. 4 relative to the sheet S and the carriage will then be mounted for reciprocation in a plane inclined to the plane of the sheet. Straight rectilinear reciprocating movement will be imparted to the knives 36 in the directions of the double arrow shown in Fig. 4 and these knives will be constantly moving so that new cutting edges of the knives are constantly presented to the sheet to produce a shearing cut through the sheet. By reason of this fact, the knife edge wears evenly and smoothly and also by reason of this fact the heat generated by the cutting action at a particular point on the knife is disseminated so that the knife does not heat at any point sufficiently to cause burning of the knife or loss of temper of the steel forming the knife. As the knife or cutting blade is of light thin material, no large mass of metal is heated up and the portion of the knife doing the cutting at any particular instant is very readily cooled. Of course, the knives can be readily thrown in and out of engagement with the sheet S by swinging the guides 21 through use of the handle 30. In similar manner the angle of the knives relative to the sheet can be easily adjusted while still maintaining proper reciprocation of the knives along the lines of the edges of the knives, as indicated in dotted lines Fig. 4. Of course, transverse adjustment of the knives on the channels 24 is readily possible, as is longitudinal adjustment of the knife shanks 35 in the carriers 31 and longitudinal extension of the knives 36 in the shanks 35.

With a thin razor edged blade, such as the knife blade 36 employed, a clean cut can be made in the paper or other sheet material without causing fuzz to accumulate on the knife to tear the paper. The straight line reciprocation given to the knife also makes the knife self-cleaning as it works up and down through the sheet S, so that at no time can any material accumulate on the knife to tend to tear the paper. This is of great advantage in connection with the work being done. At the present time it is the common practice in machines of this character to employ circular cutting blades usually working in grooves on rollers over which the sheet passes, or else it is the practice to employ stationary knives of one character or another. In either case the knives clog with fuzz from the paper, or the grooves of the grooved rollers clog with fuzz and much difficulty is encountered by reason of the tearing of the paper. This is prevented when the present construction is employed.

It will be seen that a highly efficient slitting device has been provided.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departing from the scope of the present invention which, generally stated, consists in the matter shown and described and set forth in the appended claims.

What is claimed is:

1. A paper slitting device comprising a pair of oppositely opposed bearings, a crank shaft mounted for rotation in said bearings, a pair of guide brackets, a pair of guides mounted for turning movement in said guide brackets in planes normal to said crank shaft, a pair of blocks mounted for rectilinear reciprocating movement in said guides, means for translating the rotary movement of crank portions of said crank shaft to said blocks to rectilinear movement of said blocks in said guides, a supporting structure extending between said blocks, knife shanks carried by said supporting structure and thin, light weight cutting blades attached to said shanks.

2. The structure defined in claim 1, and means for swinging said guides in said guide brackets.

3. A device for converting rotational movement to reciprocating movement in a desired direction, comprising a suitably journaled crank shaft, means for driving said crank shaft, a support, a guide mounted for turning movement on said support, a block mounted for straight line reciprocation in said guide, a pair of oppositely extending arms projecting from said block and the crank portion of said crank shaft working between said arms.

4. The structure defined in claim 3, and an anti-friction bearing carried by the crank portion of said crank shaft and having an outer race working against said arms.

5. The structure defined in claim 3, and means for holding said guide in various turned positions relative to said support to vary the line of reciprocation of said block.

6. A paper slitting device comprising a carriage, a supporting structure for said carriage permitting rectilinear reciprocating movement of said carriage therein, means mounting said supporting structure permitting turning of said supporting structure to vary the angle of possible reciprocating movement that may be imparted to said carriage, means for reciprocating said carriage, a knife blade carried by said carriage, and means for adjusting the position of said knife blade longitudinally of said carriage.

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